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Introduction

For Greenwood Metropolitan District (Metro), a good Comprehensive Management, Operations, and Maintenance Plan was more than a way to abate sanitary sewer overflows (SSOs): it was also a way to bring community leaders to consensus on difficult, expensive infrastructure problems. The CMOM solution is expected to yield SSO reductions within four years and pave the way for growth in the region.

Greenwood County, SC CMOM Facts

Sewer collection system serves 45,000 in semi-rural area

Consolidated network of 38 collection systems with 350 miles of sewer line, 26 pump stations, and 2 WWTPs

CMOM goal: SSO abatement and system capacity enhancement

Aging Lines, Fragmented Ownership Lead to I/I and SSOs

The collection system serving the City of Greenwood and environs sprawls over a 100-square-mile area of Greenwood County, which is located in the historic and largely rural Upper Savannah Region. This system serves a population of just under 45,000, plus several large industrial facilities that account for about 40% of the dry weather flow.

Learn more about Metro's location and service area

The system was a patchwork of 38 small collection systems and pump stations that fed into Metro's trunk lines, two pump stations, and two wastewater treatment plants. The City of Greenwood's system was the oldest, with some 100-year-old components. Other lines ranged in age from 40 to 60 years old. Outside of the City of Greenwood system, each smaller line was designed, installed, and operated by small groups of landowners or subdivision owners in unincorporated areas that had formed into taxing subdistricts. There was no central control over system maintenance. The subdistricts had little or no resources or expertise to resolve problems beyond line blockages, and broken lines, sinkholes, failing pump stations, and leaking

manholes began to pop up across the region. The leaks allowed storm water inflow and groundwater infiltration (I/I) into the system, taxing and often exceeding the hydraulic capacity of Metro's trunk lines and pump stations. In 1998, the problem came to a head when chronic pump station overflows led the South Carolina Department of Health and Environmental Control (SCDHEC) to issue a Consent Order against Metro for allowing untreated wastewater to enter surface waters of the state.

In 1999, Metro took ownership of all the smaller systems and signed a 50-year agreement to assume operation of the City of Greenwood's system. Today, Metro is responsible for maintaining and operating 350 miles of pipe, two wastewater treatment plants, 26 pump stations, and two septic tank effluent pump systems. The 12-MGD Wilson Creek plant discharges to Wilson Creek, which flows into the Saluda River. The smaller West Alexander plant (2.2 MGD) discharges to Hard Labor Creek, which empties into the Savannah River. The average daily combined dry weather flow to these plants is 9 MGD.

Metro began tracking and recording all service calls and complaints immediately after consolidation. During 2000, the first full year of data tracking, Metro recorded 77 SSOs, of which 48 were considered reportable (more than 500 gallons, posing an imminent health risk to the public, or likely to degrade environmental resources).

The Local Solution: CMOM for Baseline System Assessment, Integration and SSO Abatement

CMOM is a combination of planning tools and physical activities that help communities optimize the performance of their sewer systems.

While developing its CMOM proposal, Metro found that many of its existing best management practices covered these recommended elements. But the CMOM approach was useful in translating all the activities into a written plan that helped clarify for local civic leaders why it was necessary to provide Metro the legal authority and operational control over the entire system. Click on an area of the table at right to learn more about Metro's CMOM program.

Outreach and Communication Pivotal to Success

Partnerships Improve Plan and Gain Regulator Support

According to Metro, one of the best things they did when implementing the CMOM program was to seek the support of

SCDHEC. They see the State agency as a partner in this effort. Metro also emphasizes that open communication with SCDHEC as well as individuals in WEF, AMSA, within Metro itself and the community have provided an invaluable source of insight and support. Constant communication and education are essential for a program of this magnitude to be successful.

Outreach Wins Customer Acceptance

Because Metro's plans included an $8.00 monthly CMOM fee, customer acceptance of the new consolidated utility and the need for system-wide improvements were essential. Metro hired a public relations advisor who proposed a communications strategy.

The first step was to prepare an internal position paper on the collection system acquisition and CMOM program that would explain the impacts of SSOs, benefits of remediation, and reasons for the fee. This paper helped make sure that Metro employees, who were responsible for presenting the plan to CPW and the public, were well informed. The next step was to educate all Metro and CPW employees on the CMOM program so that they could serve as "community ambassadors." The public outreach efforts then began with bill inserts, brochures, a speakers bureau, treatment plant tours, and active communication with local media. During 1999-2000, local newspapers published eight articles in an attempt to keep the public up to date on Metro's progress.

Sample Metro doorhanger notice. Click to enlarge.

Residents are informed about construction projects affecting their neighborhoods through notices from their property associations, doorhangers, and large outdoor signs. These messages contain specific information about the work to be done, the estimated time the work will take, what impacts, if any, the residents will experience, and a phone number to call for additional information. Understanding that public education is an ongoing process, Metro has planned many more outreach activities, including an annual progress report to let the public know what improvements have been made, where funds were spent, and what is to be expected in the near future. Public response to the project has been overwhelmingly positive. Out of almost 15,000 ratepayers, only about a dozen individuals have voiced displeasure about the fee. Metro attributes its success, in part, to public relations. Ratepayers do not view Metro as an agency that has grown to seize control of the community sewage system, but rather as a welcome provider of a much needed service.

Pay-as-You Go Financing Made Possible By Advance Planning

Metro estimates the annual cost of the CMOM program at $1.3 million per year, which is financed entirely by the $8.00 monthly CMOM fee. The cost breaks down to about $800,000 per year for operations and maintenance and $500,000 per year for capital

projects.

Even though the fee appears as an itemized charge on the utility bill, it is not an entirely new charge. Previously, residents paid between $2.00 and $10.00 per month for collection system maintenance in the form of non-itemized pro-rata taxes that were levied by the former individual utility owners. Since the consolidation, these taxes have been eliminated.

Excellent planning and good resources have contributed to the successful funding of Metro's CMOM program. Metro uses both a long range Capital Improvements Plan (updated every five years) and a long-term Financial Plan (updated annually) to help anticipate the system's needs and incorporate them in budget and funding strategies. Because of these plans, Metro anticipated some of the large capital expenditures prior to the consolidation and put a rate structure in place that accumulated the necessary reserves. When the need to finance the CMOM program arrived, Metro was able to afford the initial expenditures and institute the CMOM fee when the program actually began, rather than asking customers to pay the fee for years in advance in order to build the necessary start-up capital.

The City of Greenwood also contributed a one-time $3.6 million grant to fund a high-priority remediation needed to satisfy the Consent Order, and to cover the CMOM start-up costs on its part of the system.

Self-funding and local cooperation saved Metro customers almost $200,000 over the first four-year planning period. Had Metro been obligated to borrow the necessary funds for CMOM startup, rates would have been at least 14% higher, or approximately $9 per month per customer.

Results

In just one year, Metro's CMOM program has already become an integral part of its sewer management philosophy and operational strategy. Metro and its member communities have been rewarded with improved customer service, better system operations, and reduced inflow/infiltration that is expected to lead to a substantial reduction in SSOs in less than three years.

For Metro, this short-term goal is not the end of the CMOM story, but just the beginning. Unified and proactive system operation and planning will continue long after the SSO abatement goals have been achieved and will help ensure that the collection system continues meeting the region's sewer needs and water quality standards well into the future.

About Greenwood Metropolitan Service District



Greenwood County is located in northwestern South Carolina, in the historic Upper Savannah Region.

Land use in the county is about 25% urban and 75% forested. It is bordered on the north by Lake Greenwood, an impoundment of the Upper Savannah River, and to the south by the Sumter National Forest. Three watersheds fall within the county: Upper Savannah, Saluda, and Stevens.

Metro was formed in 1959 to provide wastewater treatment and trunk lines to the City of Greenwood. Over the years, 37 subdivisions and groups of homeowners surrounding the city formed special taxing subdistricts so they could disconnect residential septic systems and route the flow into Metro's treatment plants. In 1999, Metro agreed to take ownership of these smaller lines and signed a 50-year maintenance agreement for the City of Greenwood's collection system.

Today, Metro's service area covers a 100-square-mile area in the middle section of the county. It encompasses the city of Greenwood and 37 surrounding unincorporated areas. The long-term plan for the region calls for the City of Greenwood to expand the city boundaries to incorporate many of these areas.

CMOM GOALS, ORGANIZATION AND LEGAL AUTHORITY

SSO Rule Requirement:

Goals: The permittee must specifically identify major program goals, consistent with environmental and human health protection rules and policies as stated in the SSO Rule.

Organization: The permittee must identify administrative and management positions responsible for implementing measures in the CMOM program, including lines of authority. It must also document the chain of communication for reporting SSOs, from receipt of a complaint to notification of permitting authority officials, other affected agencies, and the public.

Legal Authority: Legal authority must be obtained through sewer use ordinances, service agreements, or other legally binding documents, to carry out the CMOM requirements of the SSO Rule.

Metro's Response

Goals

In cooperation with SCDHED, Metro has established short- and long-term goals for its program. Short term goals are expected to be complete by 2003, within three years of program initiation. They include:

- Performing system survey and GIS-based mapping activities needed to fully develop the CMOM program;
- Collecting water quality and hydrology data to characterize the collection system's current environmental impact;
- Performing a system capacity evaluation to identify hydraulic deficiencies; and
- Performing short-term, high-priority system rehabilitation projects to immediately improve system performance.

Metro's long-term goals are also being addressed during the three-year start-up phase, but will continue on into the future. They include:

- Implementing a prioritized capital improvement program to resolve identified structural failures and ensure adequate capacity;
- Reducing SSOs; and
- Improving customer service; and
- Instituting information and asset management systems to facilitate long-term planning and ongoing operations and maintenance.

Organization

In accordance with EPA's proposed SSO rule, Metro has identified administrative and management positions responsible for implementing measures in the CMOM program. It has also documented the chain of communication for reporting SSOs, from the receipt of a complaint to notification of SCDHEC officials, other affected agencies, and the public.

Legal Authority

The Greenwood Metro Rules and Regulations were updated and approved in 1999, along with a new set of Wastewater Collection System Specifications. These two ordinances give Metro the legal authority to:

- Control infiltration and connections from inflow sources
- Require sewers/connections to be properly designed and constructed;
- Ensure proper installation, testing and inspection of new and rehabilitated sewers;
- Perform routine preventive operation and maintenance activities;
- Assess current capacity of the collection system and treatment facilities;
- Identify and prioritize structural deficiencies, with short- and long-term rehabilitation programs;
- Ensure appropriate personnel training on a regular basis; and
- Develop and maintain equipment and replacement parts inventories.

This legal authority extends to all publicly-owned elements of the sewer collection system. Metro does not currently have legal authority or operational control over private service lines.

Measures and Activities

SSO Rule Requirement: The CMOM program must include the eight measures and activities listed below, as they may be appropriate and applicable to each permittee's system.

Metro's Response

The measures and activities undertaken by Metro reflect its commitment to proactive problem-solving, achieving SSO abatement on an accelerated schedule, and fully developing and implementing its CMOM program.

- **Adequate Maintenance Facilities and Equipment.** Early in 2000, Metro hired additional personnel and purchased equipment needed to carry out a physical survey of the system, perform system-wide cleaning and rehabilitation of sewer lines and manholes, and to perform routine operations and maintenance of pump stations. New equipment included five service trucks, a backhoe, a large dumptruck, two combination trucks, a cement mixer, a television van, two generators, an easement machine, and flow monitoring and traffic safety equipment.
- **Development and maintenance of a map of the collection system.** Metro is performing a system-wide survey of above-ground physical structures to develop a GIS of the system. This system is being updated as maintenance activities, construction activities, line changes, and preventative maintenance activities are completed.
- **Management of information and use of timely information to establish and prioritize CMOM activities.** Metro performs routine flow monitoring of the system using a rotating 15-gauge network, to identify sources of inflow and determine the capacity impact of new connections. Water quality samples are collected monthly up and downstream of nine major pipe crossings and analyzed for fecal coliform loads. Emergency calls are tracked and responded to immediately, per Metro's Overflow Emergency Response Plan. All of this data is analyzed on at least on a quarterly basis and submitted to SCDHED. Any patterns indicating SSO or capacity problems are investigated and resolved.
- **Routine preventive operation and maintenance activities.** Metro is in the process of completing a thorough system cleaning and rehabilitation program. As this work progresses, Metro is developing a GIS layer that will be linked to information management software to be used for developing and scheduling a planned preventive maintenance program for all pump stations, treatment plans, and the collection system.
- **A program to assess the current capacity of the collection system and treatment facilities.** Metro is completing a formal System Evaluation and Capacity Assurance Plan (SECAP).
- **Identification and prioritization of structural deficiencies along with short- and long-term rehabilitation plans to address them.** This activity is described in detail under the SECAP section.
- **Appropriate training on a regular basis.** Training includes annual safety training for field personnel, construction inspection training for Engineering Services Division personnel, and SSO emergency response training.
- **Equipment and replacement parts inventories, including identification of critical replacement parts.** Metro's maintenance staff have created an inventory of all system parts and maintain adequate supplies of critical replacement items.

Design and Performance Provisions

SSO Rule Requirement: Permittees must establish construction requirements and standards for the installation of new appurtenances to the system, and procedures for inspecting and testing installations. These standards are essential to avoid improper connections, premature line and equipment failures, interferences with other infrastructure, etc.

Metro's Response

Metro met this requirement in January 2000 by establishing an Engineering Services Department which is responsible for maintaining an oversight presence during the construction of trunk lines, collection lines, and sewer taps, and performing inspections to ensure they meet construction requirements. New sewer lines are air-tested and closed-circuit televised and manholes are vacuum tested. All new construction must be warranted by the contractor for one year. Final acceptance of the construction is contingent on routine inspection performed in the 11th month. When possible, this inspection is performed under high groundwater conditions.

These construction requirements and inspection procedures are detailed in Metro's Wastewater Collection Systems Construction Manual.

The benefits of construction standards became apparent in the first year of CMOM, when Metro inspectors who were routinely televising a new line discovered numerous flaws, including reversed grade, damaged pipe, and bad transition joints. By having the problems corrected before the line was placed in service, Metro recouped several hundred thousand dollars in damage and avoided a potential premature line failure.

Monitoring, Measurement, and Program Modification

SSO Rule Requirement: The proposed SSO rule calls for monitoring of the major CMOM program elements. The information gathered should be used to evaluate the performance of each element, leading to program adjustments as needed.

Metro's Response

Metro has provided several monitoring programs to track the effectiveness of its CMOM activities in achieving the major program goals, including:

- **I/I reduction.** Metro tracks weekly inflow to its two treatment plants, in addition to weekly rainfall. The inflowing sewage is sampled for biological oxygen demanding substance (BOD) concentrations. I/I reductions will be evident when large rainfalls do not significantly increase inflow levels, and when BOD concentrations remain relatively consistent, suggesting that the sewage is not being diluted by I/I.
- **System capacity assurance.** Metro continuously monitors flow within the system to assess system function and identify hydraulic weaknesses. Metro expects to create additional capacity by reducing I/I and by augmenting capacity in the trunk lines and pump stations. As these improvements are completed, success will be measured by increased capacity throughout the system under peak flow conditions.
- **Emergency calls and SSOs.** All emergency calls and SSOs are recorded, along with a complete record of the response. As the CMOM program progresses, Metro expects the number of emergency calls and SSOs to decrease.
- **Water quality protection.** Metro began a stream monitoring program in 1999 to evaluate water quality up and downstream of eight pipe crossings. Fecal coliform grab samples are collected monthly at each of the eight locations and analyzed. If unacceptably high concentrations are detected, Metro will investigate and undertake any necessary repairs.

Metro has the flexibility to incorporate programmatic adjustments on short-term and long-term schedules, if monitoring data indicates that measures are not helping the system meet the stated CMOM program goals.

Overflow Emergency Response Plan

SSO Rule Requirement: The CMOM program must include an overflow emergency response plan that includes measures to protect public health and the environment; a way for the operator to be made aware of all overflows; assurance that overflows are properly responded to, such as notifying and dispatching personnel immediately; immediate notification of public, health agencies, other impacted entities, and the permitting authority; identification of officials by name who will be notified; proper personnel training; and an emergency operations plan.

Metro's Response

Metro has two overflow response plans: one for major, or reportable SSOs, and one for smaller overflows that are contained and resolved and that don't meet South Carolina's threshold for SSO reporting. In the event of a major SSO, Metro has established agreements with all industries upstream of the overflow to discontinue discharging into the collection system until repairs are completed. Metro then immediately notifies its permitting authority, the South Carolina Department of Health and Environmental Control (SCDHEC), submits a written report within 24 hours, and informs the local media. Response measures are undertaken immediately.

For less severe overflows, there is a 24-hour emergency hotline that reaches an on-call technician who must be on the site of the complaint within 30 minutes.

For emergency operations, Metro is equipping its treatment plants with SCADA capabilities that will activate an alarm off-site and allow a Metro staff member to operate key elements of a plant or pump station from an off-site computer. Metro also plans to upgrade all pump station alarm systems so that each one has a light and horn system backed up by a phone alarm system. In the event of a power outage, Metro has two portable generators and pump-around capabilities at five pump stations. The remaining stations either are, or will be, wired for generator power.

System Evaluation and Capacity Assurance Plan (SECAP)

SSO Rule Requirement: SECAP is required if SSOs or treatment plant water quality violations are occurring. The system evaluation should include an estimation of peak flows (including escaped SSO volumes), estimates of the capacity of key system components, and identification of major hydraulic deficiencies leading to SSOs.

The capacity enhancement plan includes measures that will be undertaken to address each deficiency. The measures should be prioritized, subjected to alternatives analysis, and committed to a schedule.

Metro's Response

System Evaluation

The system evaluation includes flow monitoring, physical assessment, and hydraulic modeling.

Flow monitoring has been used since 1996 to gather peak flow data and identify areas where I/I is occurring. These areas are given higher priority for physical assessment and rehabilitation. Metro uses a 15-meter system that is moved through the system on a rotating basis, and also maintains a network of permanent groundwater and rainflow gauges.

Click here to review Metro's System Evaluation Progress Report for 2000.

Metro is completing a physical assessment of the entire system to create a GIS-based inventory of components, including manholes, lines, pump stations, and valves. Urgent rehabilitation, minor repairs, and needed maintenance are completed as problems are encountered. Larger rehabilitation projects are documented and added to the list of deficiencies to be resolved under the Capacity Assurance Plan. The trunk systems are fully documented, and the rest of the physical assessment is expected to be complete in 2003.

Sewer lines are cleaned, rehabilitated as necessary, and tested for I/I. Methods include smoke testing when the water table is low, or dyed-water flooding with closed circuit television inspection.

Manholes are informally inspected by the line crews and then formally evaluated by the above-ground assessment crew. In I/I problem areas, manholes are vacuum tested and repaired as needed.

Capacity Assurance Plan

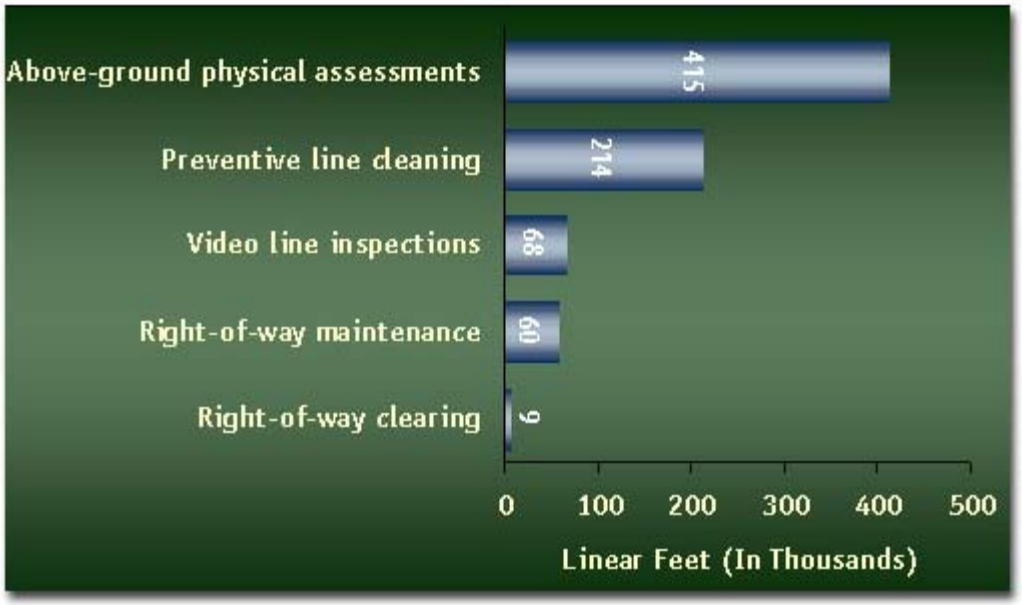
Physical survey crews make minor repairs as they encounter them. In addition, some major structural problems may be repaired at the time of discovery if they appear to pose an imminent risk of causing an SSO. Remaining line and manhole rehabilitations will be prioritized on a system-wide basis. Metro is using flow monitoring, physical assessment, and hydraulic modeling to assess whether additional collection system

capacity will be needed after the rehabilitation has been completed. Following prioritization and alternatives analysis, Metro will develop a capital improvements plan and schedule, expected to begin in 2003.

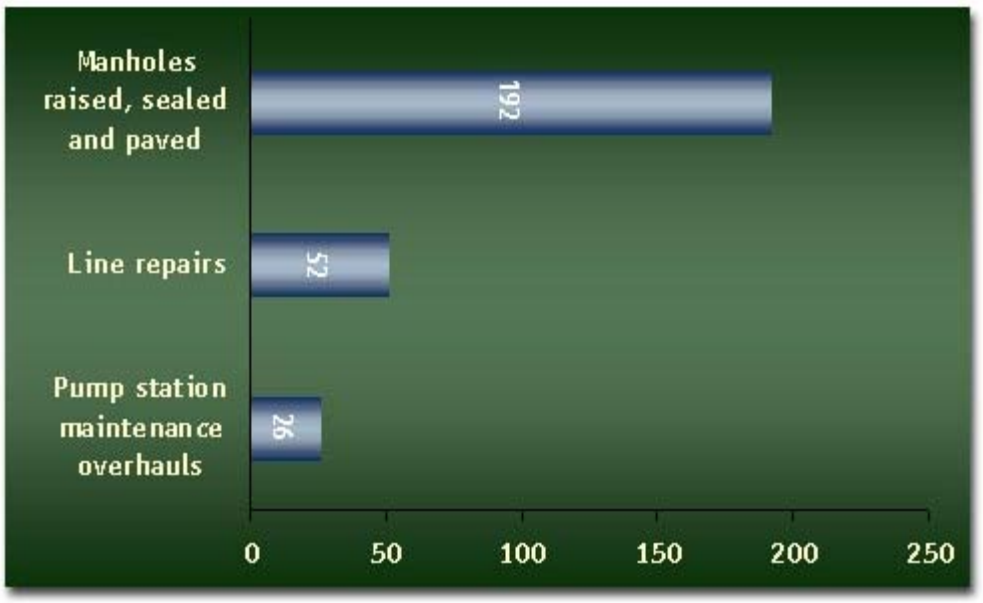
Metro's 2000 System Evaluation Progress Report

In its first year of CMOM, Metro completed 35% of its system physical evaluation. The priorities were 1) Identifying, mapping and repairing manholes; 2) surveying, cleaning, and point-repairing damaged lines, and 3) identifying system deficiencies and prioritizing them for later remediation. The system evaluation is expected to be complete in 2003.

This undertaking required new personnel. Between January 2000 and January 2001, four people were hired to perform above-ground manhole and line physical assessments; four were hired and dedicated to line cleaning and repair; one person was hired to routinely inspect and maintain all 26 pump stations; and two engineers were hired to inspect all construction projects and sewer taps.



Point repairs were made on an as-needed basis. As shown in the chart below, manholes required the most immediate attention. Metro found a large number of damaged inverts and sinkholes that required immediate repair. Most line repairs included sliplining and grouting, although there were some collapsed sections that required immediate replacement. Pump stations were all given thorough inspections, resulting in a number of alarm system upgrades, and a hydrogen sulfide gas monitoring/remediation program at several stations.



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CMOM Program Audit

SSO Rule Requirement: The CMOM program must be audited on a regular basis with interested parties to evaluate the implementation and performance. The extent of the audit is based on the size of the system and the number of overflows during the audit period. It should cover the program's compliance with permit requirements, identified deficiencies, and steps to address them.

Metro's Response

Metro conducts quarterly reviews and voluntarily submits reports on its CMOM program progress to SCDHEC and EPA Region 4. These audits are closely linked to Metro's annual budgeting and five-year capital improvement plan process. The five-year plan is scheduled to be updated in 2001 to reflect the new priorities developed as a result of the SECAP process.

By reporting frequently, Metro receives regulatory approval of work done under the CMOM program toward compliance with the Consent Order, and allows itself the flexibility to quickly correct course if it appears that a measure is not having the intended effect. For instance, when quarterly reports showed that I/I reduction was not having the hoped-for impact on base flows to the treatment plant, Metro added a measure to evaluate the capacity of existing trunk lines and pump stations.

NOTICE

Greenwood Metropolitan District
Collection System
Maintenance Department

For the next few days, Greenwood Metropolitan District personnel will be cleaning, smoke/dye testing and videotaping sewer lines in your area.

We wanted to make you aware of this work and are prepared to answer any questions you have about our maintenance activities.

We will not be entering any homeowners' service lines or laterals. All lines entered by our personnel during this project are owned by the District.

During the next few days, we may occasionally need to close an easement or street temporarily. This will only be done when necessary.

Thank you for your cooperation and understanding.